WHAT IS CLAIMED IS:

1. An apparatus comprising:

a) a carousel that is rotatable around an axis, the carousel comprising a plurality of reaction mounts, each reaction mount comprising at least one reaction well arranged on a radius with respect to the axis, the radii spaced apart at equal angles, whereby the wells are arranged in at least one concentric circle around the axis;

b) a rotator that rotates the carousel step-wise around the axis, each incremental step docking each of the reaction mounts at a separate station;

c) a fluid delivery system that delivers liquid to at least one reaction well in each of a plurality of docked reaction mounts;

d) a drain system that drains liquid by differential pressure from at least one reaction well of each of a plurality of docked reaction mounts; and

e) a programmable digital computer that controls the rotator, the fluid delivery system and the drain system.

2. The apparatus of claim 1 wherein:

(i) each reaction well comprises a drainage hole;

(ii) the carousel comprises a plate which comprises a plurality of liquid conduits that connect with the drainage holes and are engagable with the drain system; and

(iii) the drain system is a vacuum drain system comprising:

(1) a plurality of vacuum lines that connect with vacuum source and

(2) conduit engagement means that engage the vacuum lines with a plurality of the liquid conduits when the reaction mounts are docked at a station, whereby liquid in the reaction wells is drained through the vacuum lines.

3. The apparatus of claim 2 wherein:

(i) each liquid conduit comprises:

(1) a depression in the plate below the reaction mount which forms a chamber with the reaction mount, wherein the chamber communicates with the drainage holes of the reaction mount;

(2) an exit port exiting under the plate; and

(3) a bore through the plate the connects the chamber with the exit port; and

(ii) the conduit engagement means comprises:

(1) a non-rotating connector plate positioned under the carousel; the connector plate having an engagement port that is engagable with the exit port positioned at each station, wherein each of a plurality of the engagement ports is connected to a vacuum line; and

(2) an actuator that raises the connector plate to engage the plurality of engagement ports with the plurality of exit ports.

4. The apparatus of claim 2 wherein the fluid delivery system comprises:

(i) an assembly positioned above the carousel, the assembly comprising a plurality of dispensing modules mounted at each of a plurality of the stations, each dispensing module comprising a dispensing head adapted to deliver fluid to the well of a reaction mount docked at the station;

(ii) a plurality of fluid dispensers, each dispenser adapted to dispense an amount of fluid;

(iii) a plurality of fluid lines, each fluid line connecting a fluid dispenser to a dispensing head.

5. The apparatus of claim 2 wherein the number of reaction mounts equals the number of stations.

6. The apparatus of claim 2 wherein the carousel comprises 24 reaction mounts.

7. The apparatus of claim 2 wherein the reaction mounts each comprise 8 reaction wells.

8. The apparatus of claim 2 wherein the fluid delivery system delivers liquid to at least one reaction well in each of at least 3 docked reaction mounts and the vacuum drain system drains liquid from at least one reaction well of each of at least 3 docked reaction mounts.

9. The apparatus of claim 2 further comprising a temperature controlling system that regulates the temperature of at least one reaction mount docked at a station.

10. The apparatus of claim 2 further comprising an optical analyzing system that optically analyzes fluid in a well of at least one reaction mount docked at a station.

11. The apparatus of claim 4 wherein:

(i) each reaction mount comprises a plurality of wells;

(ii) each dispensing module comprises a motor that moves the dispensing head to positions suitable for delivering fluid to each of the plurality of wells.

12. The apparatus of claim 4 wherein at least one station comprises both a dispensing module and an engagement port connected to a vacuum line.

13. The apparatus of claim 4 wherein each reaction mount comprises a plurality of wells; the wells being spaced apart about the distance of wells in a row of a 96-well microtiter plate.

14. The apparatus of claim 4 further comprising an airtight chamber that comprises the rotator, the dispensing assembly, the carousel and the connector plate.

15. The apparatus of claim 11 wherein at least one dispensing head is connected to a plurality of fluid dispensers by fluid lines.

16. The apparatus of claim 14 wherein the chamber comprises an upper chamber and a lower chamber wherein the upper chamber comprises the rotator and the dispensing assembly, and the lower chamber comprises the carousel and the connector plate, and wherein the lower chamber can be in a raised or lowered position with respect to the upper chamber, and wherein in the raised position, the chamber forms an airtight seal.

17. The apparatus of claim 14 comprising a regulator which regulates a directional flow of a gas to the upper chamber.

18. The apparatus of claim 16 further comprising a bellows connected to the regulator and to the upper chamber which functions as a reservoir for the gas.

19. A method for performing in parallel a series of physical steps in a chemical reaction protocol, wherein the protocol generates a chemical linkage in a parent molecule, the method comprising:

a) providing a carousel that is rotatable around an axis, the carousel comprising a plurality of reaction mounts, each reaction mount comprising at least one reaction well arranged on a radius with respect to the axis, the radii spaced apart at equal angles, whereby the wells are arranged in at least one concentric circle around the axis, wherein each well comprises the parent molecule attached to a solid support;

b) rotating the carousel step-wise around the axis at least once, each incremental step docking each of the reaction mounts at a separate station, wherein (1) each station is dedicated to perform a physical step in the series during a docking, wherein the physical steps include adding a liquid to a well, draining a liquid from a well, and incubating; and (2) the stations are arranged to perform the series of physical steps in sequence; and

c) performing, with each rotation of the carousel, the series of physical steps in a reaction well of each of at least two of the reaction mounts, whereby a chemical linkage is generated in the parent molecule.

20. The method of claim 19 comprising rotating the carousel a plurality of times.

21. The method of claim 19 comprising, with at least one rotation of the carousel, performing the series of steps in a reaction well of all of the reaction mounts.

22. The method of claim 19 wherein the series of steps is not performed on a reaction well of at least one reaction mount during at least one rotation, whereby the reaction mount skips the protocol during that rotation.

23. The method of claim 19 wherein the parent molecule is cleavable from the solid support.

24. The method of claim 19 wherein there are 24 stations.

25. The method of claim 19 wherein the chemical linkage links a component to the parent molecule.

26. The method of claim 19 carried out in an inert atmosphere.

27. The method of claim 19 wherein the physical steps further include washing a well, wherein washing comprises both adding fluid to a well and draining fluid from a well at a single station.

28. The method of claim 19 wherein the steps include heating a well.

29. The method of claim 19 wherein the steps include optically analyzing a well.

30. The method of claim 19 wherein the chemical linkage is selected from at least one of a phosphodiester bond, a phosphorothioate bond, a phosphonate bond, a phosphoramidate bond, an amide bond, an imine bond, a carbamate bond, an azo bond, a sulfone bond, a sulfonide bond, a sulfonamide bond, a sulfide bond, a disulfide bond, an ether bond, an ester bond, a thiourea bond, a urea bond and a carbon-carbon bond.

31. The method of claim 19 wherein the chemical linkage generates a new chemical linkage in the parent molecule but does not link a component to the parent molecule.

32. The method of claim 25 wherein the parent molecule is a polymer and the component is a monomer.

33. The method of claim 25 wherein the parent molecule is a scaffold molecule and the component is an atom or molecule.

34. The method of claim 25 wherein a different fluid comprising a different component is added to different wells, wherein the different fluid added to a well is controlled by a programmable computer, whereby a library of different parent molecules is created.

35. The method of claim 32 wherein the polymer is a nucleic acid.

36. The method of claim 32 wherein the polymer is DNA.

37. The method of claim 32 wherein the polymer is RNA.

38. The method of claim 32 wherein the polymer is a peptide nucleic acid.

39. The method of claim 32 wherein the polymer is a polypeptide.

40. The method of claim 34 wherein the computer directs the generation of a library of polymers of predetermined sequence.

41. The method of claim 35 wherein the nucleic acid is coupled to a solid support in the well and the series of physical steps includes, in sequence:

(i) washing the support;
(ii) dispensing a liquid comprising a deblocking agent to remove the protecting group;
(iii) draining the liquid comprising the deblocking agent;
(iv) washing the support;
(v) dispensing a liquid comprising a coupling activator;
(vi) dispensing a liquid comprising a protected nucleotide;
(vii) draining the liquid comprising a protected nucleotide;
(viii) dispensing a liquid comprising a capping agent;
(ix) draining the liquid comprising the capping agent;
(x) washing the support;
(xi) dispensing a liquid comprising an oxidizer; and
(xii) draining the liquid comprising the oxidizer.

42. The method of claim 35 wherein the monomer is a modified nucleotide comprising a minor groove binder.

43. The method of claim 35 comprising rotating the carousel to produce a nucleic acid having between 5 and 200 nucleotides.

44. The method of claim 39 comprising rotating the carousel to produce a polypeptide having between 5 and 50 amino acids.

45. A method for performing in parallel a series of physical steps in a chemical protocol, the method comprising the steps of:

a) providing a carousel that is rotatable around an axis, the carousel comprising a plurality of reaction mounts, each reaction mount comprising at least one reaction well arranged on a radius with respect to the axis, the radii spaced apart at equal angles, whereby the wells are arranged in at least one concentric circle around the axis, wherein each well comprises the parent molecule attached to a solid support;

b) providing a rotator that rotate the carousel step-wise around the axis, each incremental step docking the reaction mounts a station, wherein: (1) each station is dedicated to perform a physical step in the series during a docking and (2) the stations are arranged in series from an initial station that performs an initial physical step in a series of physical steps in a chemical protocol to a final station that performs a final physical step in the series of physical steps;

c) performing an initial rotation of the carousel around the axis, wherein the stations begin to perform the series of physical steps as a reaction mount docks at the initial station; and

d) performing a final rotation of the carousel around the axis, wherein the stations cease to perform the series of physical steps as a reaction mount docks at the final station;

whereby the initial and final rotations result in one complete series of steps on a reaction well of each reaction mount.

46. The method of claim 45 further comprising performing at least one intermediate rotation between the initial and final rotations.